REMARKS

Claims 1-24 were pending in the present application. In the foregoing amendments, claims 1, 7, 10, and 13 have been amended; new claims 25-26 have been added; and claims 3, 8-9, 14-15, and 17-24 have been canceled herein, without prejudice, to the prospective filing of one or more divisional patent applications. Support for these amendments can be found in the specification and claims of the application as filed. No new matter has been added by these amendments.

Applicant respectfully requests entry of the foregoing amendments and reconsideration of the application in light of the amendments above and the remarks below.

Claim Objections

In the Office Action mailed November 21, 2007 ("Office Action"), claims 1 and 7 stand objected because of informalities. In particular, the Office Action objected to the term "adapted for" used in the pre-ambles of these claims (see (Office Action, page 2, lines 8-10).

In the foregoing amendments, claims 1 and 7 have been amended accordingly to overcome the above objection. Accordingly, Applicant respectfully requests that the objection of claims 1 and 7 be withdrawn.

Claim Rejections under 35 U.S.C. § 101

The Office Action rejected claims 1-12 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. In particular, the Office Action states that "[t]he subject claims recite "LS codes"[,] the term is vague and indefinite, while the specification mentions LS codes, however, it is not clear from the specifications and/or drawings which codes are LS codes and how are they defined." (Office Action, page 3, lines 2-4.). Applicant respectfully traverses.

Applicant submits that the term "LS codes" is disclosed in Applicant's specification. For example, paragraph [0013] of Applicant's specification states: "In another type of spread spectrum wireless communication system, referred to as a Large Area Synchronized-Code Division Multiple Access (LAS-CDMA) system, **specially designed codes**, referred to as "**LS**" and "LA" **codes**, are used to spread the signals for transmission" (emphasis added).

In addition, the term "LS codes" has been known in the art. As an example, attached in Appendix A is a document entitled "LAS CDMA presentation," 3GPP RAN WG1, April 10th-14th, 2000, in which the properties of LS codes are further described.

6

In view of the foregoing, Applicant respectfully requests that the 35 U.S.C. § 112, first paragraph, rejection of claims 1-12 be withdrawn.

Claim Rejections under 35 U.S.C. § 102(e)

Claims 1, 2, 4, 7-8, 11-13, and 16-24 stand rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Agree (US 6, 512, 737). Applicant respectfully traverses.

To expedite prosecution of the present application, in the forgoing amendments, independent claim 1 has been amended to explicitly incorporate all of the limitations of claim 3, which was objected to in the Office Action. Thus, claim 1 as amended is allowable. Applicant respectfully requests that the rejection of claim 1 be withdrawn.

Independent claim 7 has been amended to explicitly incorporate all of the limitations of claim 9 (including those of intervening claim 8), which was objected to in the Office Action. Thus, claim 7 as amended is allowable. Applicant respectfully requests that the rejection of claim 7 be withdrawn.

Independent claim 13 has been amended to explicitly incorporate all of the limitations of claim 15 (including those of intervening claim 14), which was objected to in the Office Action. Thus, claim 13 as amended is allowable. Applicant respectfully requests that the rejection of claim 15 be withdrawn.

Claims 2, 4-6, 10-12, and 16 each depend directly or indirectly from one of independent claims 1, 7, and 13, and are therefore allowable for at least the reasons noted above for claims 1, 7, and 13. Accordingly, Applicant respectfully requests that the rejection of these claims be withdrawn.

New Claims

New claims 25-26 recite features similar to those found in independent claims 1 and 13, respectively, and therefore are allowable for at least the reasons noted above for claims 1 and 13.

Allowable Subject Matter

The Office Action objected to claims 3, 5, 6, 9, 10 and 15 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant appreciates the Examiner's indication of allowable subject matter in the application.

7

REQUEST FOR ALLOWANCE

In view of the foregoing, Applicant submits that all pending claims in the application are patentable. Accordingly, reconsideration and allowance of this application is earnestly solicited. Should any issues remain unresolved, the Examiner is encouraged to telephone the undersigned at the number provided below.

Respectfully submitted,

Date: February 21, 2008

By: /Jian Ma/
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8

Appendix A

LAS CDMA presentation

3GPP RAN WG1
Seoul, Korea
April 10th-14th, 2000

Presented by WG1 of CWTS.

Requirements for 3G enhancements

- Better spectral efficiency to allow higher capacity on same spectrum resource:
  - Voice capacity: needs to be increased by a significant factor
  - Data speed and capacity: need to develop air interface to fulfill the needs of the wireless Internet
- Backward compatibility with existing systems is required
- Ability to evolve to future systems such as All IP networks

LAS-CDMA introduction

- LAS-CDMA properties:
  - High speed data (16Mbps shared peak rate)
  - LAS-CDMA can be compatible with all 3G standards
  - Perfect fit for future All IP networks (beyond 3G)

LAS-CDMA technology overview

- Current CDMA systems are interference limited:
  - Multiple sorts of interference:
    - ISI = Inter-Symbol Interference (auto-correlation sidelobes)
    - MAI = Multiple Access Interference (cross-correlation sidelobes)
    - ACI = Adjacent Cell Interference
    - Negative impact on capacity and performance
  - Complex Power Control and interference reduction methods are the current remedy

LAS-CDMA technology overview

- LAS-CDMA offers a better alternative:
  - It has been proven that there exists no "ideal" Multiple Access codes:
    - Welch bounds (theoretical limit = no ideal code)
    - Auto-correlation and cross-correlation are self contradictory
    - All efforts to find "ideal codes" have been inconclusive
  - LAS-CDMA uses LAS codes to work around this limit

LAS-CDMA technology overview

- LAS-CDMA codes eliminates all interference within an "Interference Free Window" (IFW):

  - Eliminating all side lobes of the MA codes within a certain delay window: e.g. $(-d, +d)$ where d is the maximum delay dispersion of the channel
  - "near far effect" is mostly eliminated
  - Capacity is greatly enhanced

LAS-CDMA technology overview

- LAS codes consist of LA and LS codes

- LA codes:
  - reduce ACI
  - provide cell differentiation: different LA code permutations are used in different cells sectors

- LS codes:
  - realize Multiple Access codes
  - reduce ISI and MAI
  - number depends on the interference free window size: the better the propagation environment, the more LS codes
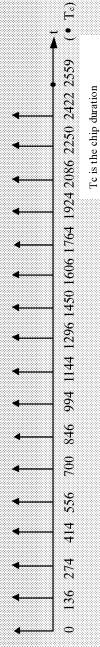
LA code constuction

- Prior to encoding, choose an orthogonal code group with L orthogonal codes.

- Insert zero strings between the elements of the orthogonal codes with different length

- Rules:

  - All but one length of intervals between nonzero elements are even;

  - Each length of interval between nonzero elements can only appear once;

  - No length or length summation of intervals between nonzero elements can be equal to a summation of others.

The resulting codes, called LA codes, are designated by a triplet (L, N_o, N). N is the code length, N_0 is the minimum interval length and L is the number of pulses

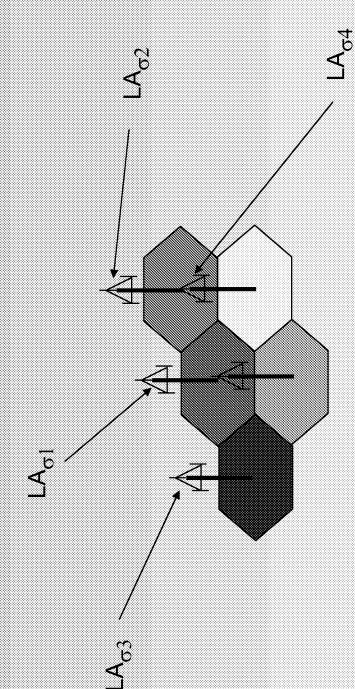- Patent number PCT/CN98/00151 for reference

Proposed LA codes

- (17,136,2559) LA codes are used in all LAS-CDMA modes, including FDD and TDD

Time Slot Sequence in the Primary LA Code

Length Index	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Length (chips)	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	172	137
LA pulse position	136	274	414	556	700	846	994	1144	1296	1450	1606	1764	1924	2086	2250	2422	2559

0 136 274 414 556 700 846 994 1144 1296 1450 1606 1764 1924 2086 2250 2422 2559   ($\cdot T_c$)

T_c is the chip duration

- New LA codes can be constructed from the primary code by permuting the time slot sequences

Cellular network design

$LA_{\sigma 1}$
$LA_{\sigma 2}$
$LA_{\sigma 3}$
$LA_{\sigma 4}$

$LA_{\sigma i}$ identifies the ith permutation of the primary LA code
(see permutation matrix on next slide)

LA code Permutations

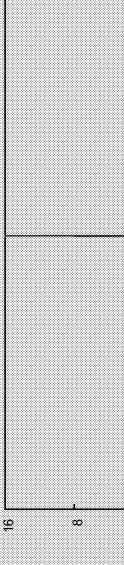|	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
σ1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
σ2	2	4	6	8	10	12	14	16	1	3	5	7	9	11	13	15
σ3	3	6	9	12	15	1	4	7	10	13	16	2	5	8	11	14
σ4	4	8	12	16	3	7	11	15	2	6	10	14	1	5	8	13
σ5	5	10	15	3	8	13	1	6	11	16	4	9	14	2	7	12
σ6	6	12	1	7	13	2	8	14	3	9	15	4	10	16	5	11
σ7	7	14	4	11	1	8	15	5	12	2	9	16	6	13	3	10
σ8	8	16	7	15	6	14	5	13	4	12	3	11	2	10	1	9
σ9	9	1	10	2	11	3	12	4	13	5	14	6	15	7	16	8
σ10	10	3	13	6	16	9	2	12	5	15	8	1	11	4	14	7
σ11	11	5	16	10	4	15	9	3	14	8	2	13	7	1	12	6
σ12	12	7	2	14	9	4	16	11	6	1	13	8	3	15	10	5
σ13	13	9	5	1	14	10	6	2	15	11	7	3	16	12	8	4
σ14	14	11	8	5	2	16	13	10	7	4	1	15	12	9	6	3
σ15	15	13	11	9	7	5	3	1	16	14	12	10	8	6	4	2
σ16	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Permutation matrix

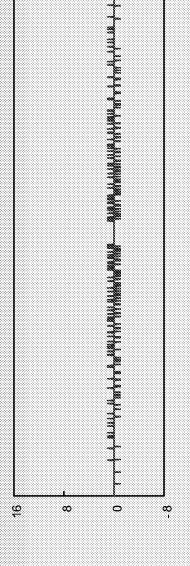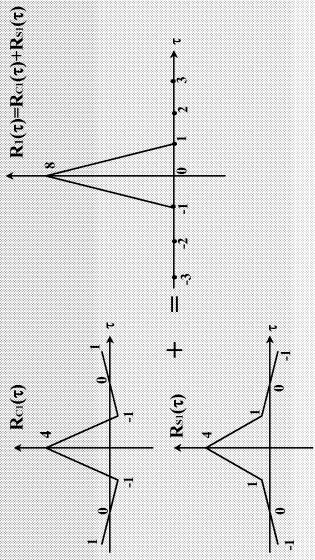# LA codes properties

Fig.1 LA code auto-correlation

Fig.2 LA code cross-correlation

Examples of LS codes
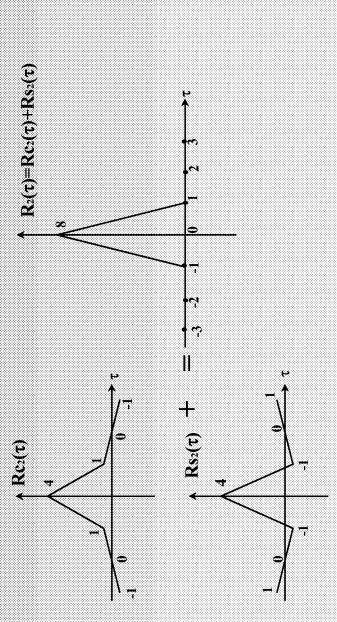
- LS codes are made up of C and S components.

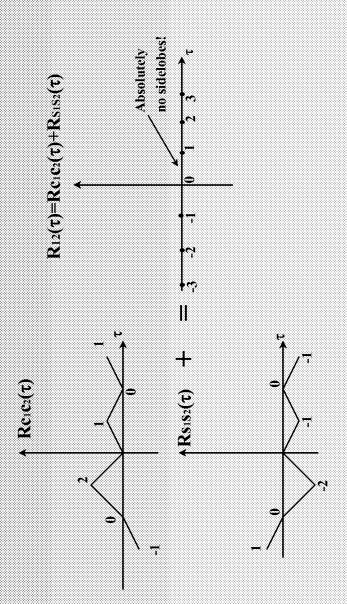- Example: Length 8 LS code $(C_1, S_1) = (++-+, +---)$

$R_{c1}(\tau)$

$R_{s1}(\tau)$

$+$

$=$

$R_1(\tau) = R_{c1}(\tau) + R_{s1}(\tau)$

Note: the proposed designs use higher length LS codes

Example of LS codes

- Example: LS code $(C_2, S_2) = (+++-, +-++)$

Examples of LS codes

- Example of LS code cross-correlation

$$R_{12}(\tau) = R_{c_1c_2}(\tau) + R_{s_1s_2}(\tau)$$
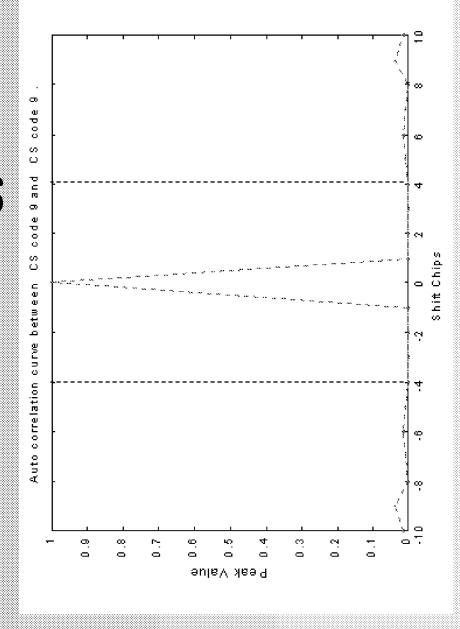
Absolutely no sidelobes!

LAS-CDMA technology overview

Figure 3 LS code auto correlation properties: length = 136, IFW = 4

LAS-CDMA technology overview

cross correlation curve between CS code 9 and CS code 10 .
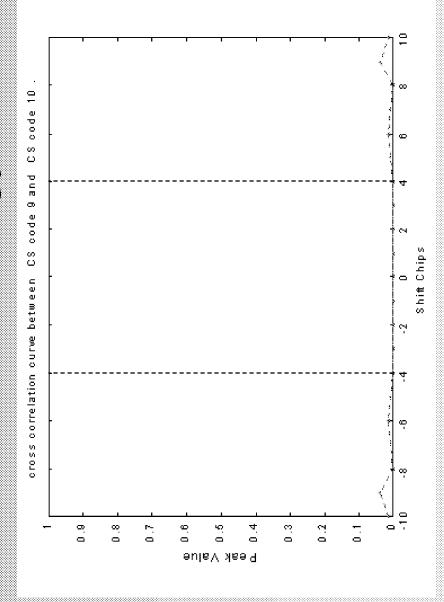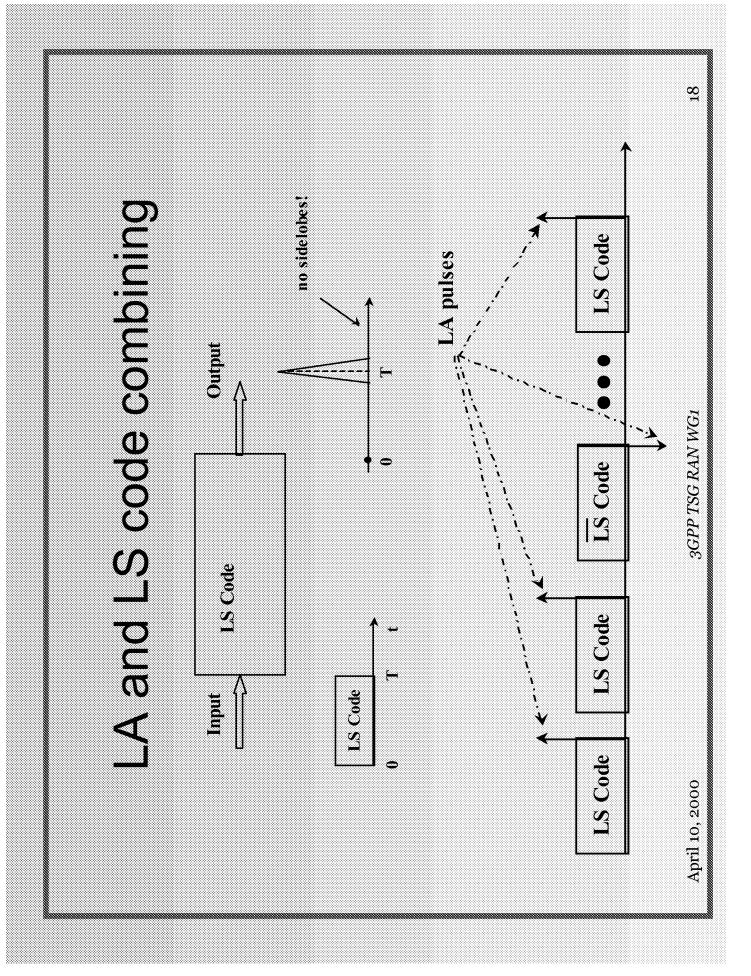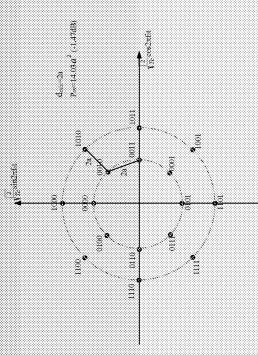
Figure 4 LS code cross correlation properties: length = 136, IFW=4

3GPP TSG RAN WG1

LA and LS code combining

Input → [LS Code] → Output

[LS Code]

0   T   t

no sidelobes!

0   T

LS Code

LA pulses

LS Code

LS Code

LS Code

LS Code

LS Code

Modulation/Coding for LAS-CDMA

- Adaptive modulation and coding is used:
  - Enhanced 16 QAM or 64 QAM for pilot and traffic channels

  - 64 QAM for example in indoor environment
  - Adaptive error coding rate (1/2 or 3/4)

LAS-CDMA modes

Compatibility

- Same chip rate, carrier spacing, frame length/structure
- Layer 2 and 3 compatibility
- Same core network architecture and protocols
- LAS-CDMA modes based on WCDMA and other existing 3G systems

LAS-CDMA technology overview

- Data rate enhancement based on 3.84Mcps for TDD / FDD

Environments	Peak Data Rate (16 QAM)	Peak Data Rate (64 QAM)
Vehicular	2.6Mbps	-
Pedestrian	5.32Mbps	8Mbps
Indoor	10.6Mbps	16Mbps

LAS-CDMA technology overview

- Data rate enhancement based on 1.28Mcps for TDD

Environments	Peak Data Rate (16 QAM)	Peak Data Rate (64 QAM)
Vehicular	800Kbps	-
Pedestrian	1.6Mbps	2.4Mbps
Indoor	3.2Mbps	4.8Mbps

LAS-CDMA system aspects

- SHO is not mandatory:
  - Leads to simpler implementations
  - SHO not required for packet data
- Complex power control not required
  - Near-far effect is mostly eliminated with LAS-CDMA
  - TDMA style power control to maximize battery life
- Uplink and downlink synchronization

LAS-CDMA variable rate support

- LAS-CDMA does not differentiate between voice and data

- Different transmission "pipes" are defined based on propagation conditions and QoS attributes

- LAS-CDMA uses a variable rate channel concept

- Adaptive modulation, coding scheme and scheduling, depending on:
  - QoS
  - Mobility
  - Radio conditions

LAS-CDMA technology overview

- LAS-CDMA is designed to inter-operate with all 3G core networks
  - can work with GSM MAP or ANSI41 network

Further enhancements

- adaptive and smart antennas
- Multi-user detection
- Transmission diversity

Conclusion

- **LAS-CDMA delivers:**
  - High capacity voice and data
  - Backward compatible solutions for all three CDMA 3G standards (investment protection)

- **LAS-CDMA is one of the solutions for enhanced 3G air interfaces**
  - CWTS would like to suggest that 3GPP considers LAS-CDMA for their air interfaces evolution in the future